

COMITE DU PLANCTON

par M.-L. Furnestin

Belgium

(R. De Clerck)

Studies on zoo- and phytoplankton distribution off the Belgian coast were made, especially in relation to the disposal of domestic and industrial waste waters.

Canada

(L.M. Dickie)

Canadian plankton researches have been mostly concerned with problems of dynamics in the coastal zone. To assess the "biological energy budget" of a water body an intensive sampling study of the production, export and grazing of the phytoplankton in a small marine coastal basin was conducted over a 25-hour period (Marine Ecology Laboratory, Bedford Institute). It was found that 58% of the production (11% of the total standing crop) was lost from the basin by exchange with the sea, and 34% was consumed by zooplankton grazing. The biological budget balanced to within a few percent, using the measured rates of grazing and export together with the small measured net change in total standing stock. However, the exchange mechanisms were different from expectation. As the tide changed, there were large variations in concentrations of chlorophyll and zooplankton at the mouth of the basin. But only 35% of the phytoplankton export was associated with the measured mean flow. The major part, 65%, was associated with fluctuations in the flow. Virtually all the zooplankton export was associated with fluctuations in the flow. This implies that very serious errors would have been made if exchanges had been calculated from daily mean transport and daily mean plankton concentrations. This result illustrates the importance of variability studies for the proper estimation of biological budgets or productivity in marine water basins.

In February 1970, the oil-tanker "Arrow" was wrecked in Chedabucto Bay, Nova Scotia, releasing some 10 000 tons of Bunker C oil into the water. Wave action on the contaminated shore-line and on surface films, together with strong mixing under nearly arctic isothermal conditions, distributed much of the dense oil throughout the water column as small particles. Studies (Marine Ecology Laboratory) showed that the size-range of a high proportion of the particles was within that of natural zooplankton food and that oil particles were being ingested. Zooplankton faeces contained approximately 7% Bunker C and approximately 10% of Bunker C in the water column was associated with the organisms. It was estimated that about 20% of the daily production of particulate oil was being sedimented to the bottom as zooplankton faeces. The oil had no apparent effect on the animals, but the concentrated bacterial flora of the faeces may have been enhancing oil degradation. It was concluded that zooplankton are an extremely important natural agent in the clearance of the spilled oil from the water column.



Studies of a 9-parameter trophodynamics model of a plankton population (Biological Station, Nanaimo, B.C.), have suggested that steady-state mean ecological efficiencies cluster closely about a value of 12%, and vary appreciably only with a change in plant growth rate, zooplankton respiration and zooplankton mortality. Studies on a 8-parameter model for primary production suggest that ocean phytoplankton populations can be characterized by a physiological/ecological "constant" which depends on plant pigments and light conditions.

The Arctic marine ecology study being carried out by the Arctic Biological Station was continued into its third year. Investigations were begun on the winter development of the sea ice flora, with particular attention being given at first to seasonal variations in the location and concentration of the plants in the ice and such related factors as phosphate and nitrate in the ice. Seasonal trends were shown in the development of the ice flora, and a start made in relating this flora to the summer phytoplankton bloom. Studies were begun on the role of the Arctic cod (*Boreogadus saida*) in upper Frobisher Bay, with particular attention being given to the feeding of the larvae.

Past studies of paralytic shellfish poisoning in Eastern Canada have been summarized in a bulletin which should be published by the Fisheries Research Board by late 1971 (See Admin. Report - Fisheries Improvement Committee - Canada).

#### Denmark

##### 1. "Danmarks Fiskeri- og Havundersøgelser" (Vøgg H. Jacobsen)

Measurements of the primary production and sampling of zooplankton by means of 8-liter water bottles have - as in the last decade - been made from three Danish light-vessels, "Aalborg Bugt", "Anholt Nord" and "Halsskov Rev". Starting from 1 January 1971 a processing of the collected data has been initiated.

The identification of fish larvae and fish eggs collected by means of the "Nackthai" sampler (a modified Gulf III-sampler) in the Kattegat, November 1970, has been completed. Likewise, collections in the Limfjord and the Øresund by means of neuston-nets and stramin-nets have been performed and the fish larvae and fish eggs have been identified and measured.

##### 2. "Grønlands Fiskeriundersøgelser" (E. Smidt)

West Greenland : In connection with hydrographic observations a total of 73 macroplankton samples (stramin-net, ring diameter 2 m, oblique hauls from ca. 50 m depth) were taken in May - December on 4 standard east-west sections in the Davis Strait (off Holsteinsborg, Sukkertoppen, Godthåb and Frederikshåb).

Displacement volumes of samples were measured and fish eggs and larvae were sorted and counted.

Programme for 1971 : The investigations will be continued.

France

(M.-L. Furnestin)

1. Travaux de l'Institut des Pêches Maritimes, Laboratoire de Nantes

Comme les années précédentes, les travaux ont porté, d'une part sur l'ichthyoplancton (Mme Arbault et Lacroix), d'autre part sur le zooplancton (Mme Beaudouin).

Ichthyoplancton

Le thème principal concerne les oeufs et larves de poissons commerciaux, plus spécialement les clupéiformes récoltés dans le golfe de Gascogne (mars, mai, juillet et novembre 1970). Les périodes et les aires de reproduction ont été déterminées et des relations faites avec les conditions hydrologiques (température et salinité). Communication au CIEM 1970 ("Oeufs et larves de Clupéidés et d'Engraulidés dans le golfe de Gascogne en 1969") et mémoire sous presse (Résultats de six années).

D'autres observations concernant les oeufs et larves prélevés au filet Hensen sur le côté ouest du Groënland (août 1970) ainsi que les larves de hareng récoltées en Mer du Nord (décembre 1969).

Des stations-test ont été établies à titre expérimental sur les secteurs de ponte de la sardine et de l'anchois, dans le but de connaître, à long terme, si leur valeur d'information est retenue, l'évolution du stock d'adultes dans le golfe de Gascogne d'une année à l'autre.

Zooplancton

L'étude des indicateurs planctoniques (Chaetognathes, Méduses, Siphonophores, Salpes et Doliolles) sur 398 stations (1964) a été achevée. Communication au CIEM ("Zooplancton. Aperçu sur le peuplement planctonique au large du golfe de Gascogne") et mémoire sous presse.

Une étude des zones-test a été entreprise afin de connaître l'environnement zooplanctonique (plus particulièrement les éléments servant à la nutrition des poissons) sur les zones riches en ichthyoplancton, donc de rassemblement des reproducteurs.

Un inventaire de la faune planctonique de pêches effectuées au Groënland en 1970 est en cours, orienté vers les groupes comprenant des éléments utilisés par les morues et sébastes.

Programme pour 1971

Poursuite des recherches sur l'ichthyoplancton des campagnes saisonnières dans le golfe de Gascogne et des stations-test sur les secteurs de ponte sardine anchois.

Poursuite des recherches sur le plancton indicateur (campagnes trimestrielles de "La Pelagia" dans le golfe de Gascogne).

Etude du trophoplancton dans le golfe de Gascogne (campagnes saisonnières et zones-test) et dans les eaux groënlandaises.

2. Travaux des Laboratoires conchylicoles de l'ISTPM

Ces travaux ont comporté :

- recherche des larves des mollusques comestibles,
- étude du microplancton des centres ostréicoles d'élevage en relation avec les conditions hydrologiques,
- inventaire du bol alimentaire des huîtres plates,
- fin de l'étude sur le verdissement des claires à huîtres (Navicula ostrearia).
- phytoplancton des eaux rouges des côtes européennes de l'Atlantique (communication au CIEM 1970).



Programme pour 1971

- recherche des larves de mollusques comestibles,
- cycle saisonnier du microplancton.

3. Travaux du Laboratoire de Biologie animale (Plancton).  
Faculté des Sciences, Marseille

Poursuite des investigations sur le plancton profond du golfe de Gascogne (en collaboration avec ISTPM) : Méduses, Mysidacés, Euphausiacés.

Etude des pêches profondes au large de la Péninsule ibérique. Compte-rendu au CIEM 1970 (J.P. Casanova, B. Casanova, F. Ducret et J. Rampal).

Etude de prélèvements à différents niveaux faits sur les côtes ouest du Groënland (campagne "Thalassa", été 1970) pour caractériser par leur peuplement planctonique les formations hydrologiques en présence.

Méditerranée : Etude systématique, morphologique, écologique et biogéographique des peuplements des bassins occidental et oriental (Ptéropodes, Euphausiacés, Mysidacés, Chaetognathes, etc), notamment dans leurs relations avec le proche Atlantique et les mers adjacentes (Mer Rouge et Mer Noire).

Programme pour 1971

Synthèse des résultats obtenus depuis 1967 sur le plancton profond du golfe de Gascogne et des côtes ibériques.

Inventaire et analyse écologique (en collaboration avec ISTPM) de prélèvements profonds effectués sur les côtes du Maroc (janvier 1971).

Méditerranée : continuation du programme précédent. En outre, étude du phytoplancton d'un secteur du bassin oriental (campagne "Thalassa" 1969, Tripolitaine).

Comparaison des faunes de Chaetognathes de l'Arctique et de l'Antarctique (collections de la "Belgica" et du "Maggie Dan").

Etude du plancton des îles Kerguelen pendant un cycle annuel, complétée par une analyse biochimique sommaire (Mission "Terres Australes", 1967-1968).

N.B. On trouvera dans la liste de publications fournie pour la France, en dehors du Rapport administratif, plusieurs travaux dans le sens de la résolution du Comité du Plancton (C.Res.1970/5:7).

Germany

(J. Krey)

Institut für Meereskunde, Universität Kiel

During 1970 the long term observations on the productivity in the Kiel Bight were continued. More than 1 000 observations on environmental and biological parameters were made (Krey, Sarma).

A new method for sampling meso-, micro- and nanoplankton was developed. By this method, problems of heterogeneity and variability were followed in the Baltic (Lenz).



An investigation of the development of plankton populations in upwelling waters was started at the coast of West Africa (Boje, Schinkowski).

Problems on the growth mechanism of dinoflagellate populations were followed (Elbrächter).

Pollution of the sea by the outlet of the Kiel sewage was investigated and single steps of eutrophication were observed in in vitro experiments (Horstman).

Bundesforschungsanstalt für Fischerei - Institut für Küsten- und Binnenfischerei, Hamburg

Plankton sampling for the study of the distribution of Crangon larvae in relation to hydrographic and other factors along the German North Sea coast was continued.

Routine investigations on the plankton composition in the Elbe estuary were also continued.

Institut für Meeresforschung, Bremerhaven

Dr D.K. Chakravarty worked on fungus infection on Coscinodiscus in the Weser estuary.

Biologische Anstalt Helgoland

#### Plankton Research 1970

1. Investigations on plankton and seston in relation to hydrographical and hydrochemical data throughout the year were continued at the station "Helgoland Reede". Every day of the week phytoplankton species composition was determined and semi-quantitative counting was made on living plankton. Quantitative counting of phytoplankton was effected on preserved samples from every week-day using the sedimentation technique.

Three times a week the following parameters were measured : Chlorophyll-a content of seston, seston weight, inorganic phosphate, nitrate, nitrite, ammonia, calcium, magnesium and pH.

2. The daily plankton investigations from German light-vessels, started in 1969, were continued in 1970. From April to October water samples from 1 m depth were taken from light-vessels "Elbe 1", "P.8" and "Borkumriff" at the same tide phase. Phytoplankton was counted quantitatively.

3. On 19 - 21 May, 8 - 10 June and 6 - 8 July quasi-synoptic plankton investigations were made in the Inner German Bight. During these three cruises with RV "Friedrich Heincke", 142 samples from surface and bottom water were taken for quantitative plankton investigations in relation to hydrological and nutrient data. Ctenophores were counted in 119 net samples of zooplankton.

4. During the cruise from 14 July to 5 August 1970 with RV "Friedrich Heincke" in the Biscaya, planktological, chemical and hydrographical investigations were carried out. In 4 sections at right angles to the French Atlantic coast gradients of plankton diversity and quantity, seston weight and chemical composition, inorganic nutrients, turbidity, salinity and temperature were measured. Water, seston and net plankton samples were collected in 5 to 25 m vertical intervals from surface to bottom down to 400 m.

5. Investigations of plankton and seston were made during the participation of two planktologists of the Biologische Anstalt Helgoland in the U.S. underwater-laboratory Projekt "TEKTITE II". Zooplankton and phytoplankton species and composition and quantities as well as organic carbon and nitrogen in the seston, were determined in the bottom water of a tropical bay with coral reefs during a 14 days underwater mission. During 24 hours plankton- and water-samples were collected several times at depths from 0.1 to 5 m above the sea floor. Furthermore, reaction of zooplankton to various light colours was studied.

Iceland  
(I. Hallgrímsson)

Zooplankton

Zooplankton was sampled in five surveys in Icelandic waters, mainly off the east coast, in the period of 18 May to 11 September. Samples were taken with a Hensen net, 50 - 0 metres and the "Icelandic High Speed Samplers" towed at 5 and 25 metres depth. Altogether 249 stations were worked.

Phytoplankton

Measurements of primary production with the  $C^{14}$  technique were carried out at 52 stations off the north-west, north and north-east coast of Iceland, from 5 June to 26 June.

The samples were taken at standard depths 0, 10, 20 and 30 metres and illuminated at ca. 13 000 lux in a temperature regulated incubator. Samples for quantitative analyses of the phytoplankton were collected at each level where productivity was measured.

Ireland  
(F.A. Gibson)

Nothing to report this year.

Netherlands  
(P. Korringa)

In the first four months of the year 1970 plankton samples have been collected in the coastal waters of the Netherlands to study the distribution of the larvae of the brown shrimp (Crangon crangon) quantitatively. It appeared that the number of shrimp larvae was considerably higher than in the three preceding years. It was expected that the landings of shrimps would be very high late in the same year. This did not materialise, presumably as a consequence of a very strong year class of 1969 cod in that very same area.

Observations have been made on the occurrence of cod larvae in the coastal waters of the Netherlands. The impression was that this must be a spawning ground of considerable importance.

Observations made in January led to the conclusion that herring larvae were remarkably numerous in the Channel. This can be explained in terms of a revival of the stock of herring spawning in that area.

The research ships "Tridens" and "Willem Beukelsz" made five plankton trips in the first quarter of 1970, to study the larvae of herring, cod and shrimp; two trips in the second quarter, to study shrimp and herring larvae; and four trips in the fourth quarter to study herring and shrimp larvae.

The periodical observations on the plankton pattern in the Dutch coastal waters have been continued in 1970. Diatom blooms occurred, but there were no signs of dinoflagellate outbreaks which could lead to the shellfish poisoning.



Norway  
(G. Berge)

1. Institute of Marine Research, Directorate of Fisheries

Phytoplankton : 1) The situation in the spring plankton development was analysed for the fourth year running at the spawning grounds of the Atlanto-Scandian Herring and the Arctic cod, between Stad and Vesterålen. The study is part of a 5 year IBP programme on the recruitment mechanism of these species, and covers taxonomic analysis (I. Nygård), measurements of the primary production, chlorophyll-determinations and particle size frequency analysis, light and turbidity measurements (G. Berge).

2) The situation in the phytoplankton and zooplankton was investigated in the Trondheim Fjord as an integrated part of a pollution study (G. Berge, H. Bjørke). The productive index (primary production of chlorophyll) was used as an indication of pollution in several suspected fjord localities (G. Berge).

Zooplankton : 1) Sampling was continued at the permanent oceanographical stations along the coast of Norway and at Station M in the Norwegian Sea. The material is worked up continually by the "short cut" method and filed on cards (K.F. Wiborg).

2) Investigations in connection with commercial fisheries for zooplankton were continued, plankton hauls being taken in the upper 100 m in fjords and coastal areas near Bergen in May. Calanus finmarchicus dominated the plankton. The main concentration of plankton was between 2-25 nautical miles from land, in patches less than 1/2 mile in extension. Near shore and in the fjords Bolinopsis was very abundant. The plankton seemed less abundant than in the foregoing season, seldom exceeding 1 - 2 ml/m<sup>3</sup> (K.F. Wiborg).

3) The distribution, abundance and drift of fish larvae was repeatedly investigated during cruises in April-May, covering the coastal banks between Stad and Lofoten. The quantitative distribution of zooplankton was simultaneously analysed and compared with the stomach contents of fish larvae. The study is for the fourth year running, part of an IBP programme (H. Bjørke).

2. Biological Station of Directorate of Fisheries, Flødevigen

1) Work was continued on the occurrence of neuston and hyponeuston, particularly ichthyo-hyponeuston in offshore waters (D. Danielssen and S. Tveite).

3. Tromsø Museum, Marinbiologisk Stasjon, Tromsø

1) For the purpose of displacement volume assessments bi-monthly samples were collected in three fjords in Troms (Malangen, Balsfjord and Ulfsfjord) and one fjord in Finnmark (Porsangerfjord) by means of divided vertical hauls with a 500 mesh Juday net.

2) Using Clarke-Bumpus Plankton Samplers and Isaacs-Kidd Midwater Trawl a number of cruises were made along the coast from the Vestfjord to the Varangerfjord in April/May in order to plot the distribution of fish eggs, larvae and young fish.

3) In the Skjomen, near Narvik, where river discharge regulations are planned, all-year samples of the local phytoplankton and zooplankton were collected by means of water bottles (upper 75 m) a 200 mesh Juday net (divided hauls, bottom-surface) and Beyer's epibenthic closing net (200 mesh).



#### 4. University of Bergen, Biological Station, Espegrend

1) The deep-water community of a Norwegian fjord. The project which was started three years ago, is aimed at investigating the ecological, particularly the trophic, relationships between the main carnivores and scavengers in an oceanic community. The regular sampling has been carried out at depths mostly between 100 and 500 m, and analysis of the first series, taken in 1968 and 1969, is nearing completion.

2) As part of a joint programme on the hydrography and biology of a land-locked and polluted fjord, the plankton has been studied during weekly sampling in the Nordåsvatn. The aim is to evaluate the effect of sewage pollution on the plankton community (K. Tange, S. Einarson, P. Johannessen).

#### 5. University of Oslo, Institute for Marine Biology

##### Department A.

1) Studies on the morphology and development of some cirriped larvae (Hansen's nauplius) were carried out by T. Schram.

2) Zooplankton of the inner Oslofjord was studied with special reference to long-term changes (F. Beyer, H. Hovde).

##### Department B.

##### 1. Phytoplankton Surveys

a) The study of the vertical phytoplankton distribution in coastal waters with a pronounced halocline (Nordåsvatn and inner Hardangerfjord). A manuscript is under preparation (U. Lillemoen).

b) The investigation of the spring phytoplankton in the spawning areas for cod and herring (Møre-Lofoten) was continued, in collaboration with the Marine Research Institute, Fisheries Directorate, and part of the Norwegian IBP-PM programme (I. Nygaard).

c) In collaboration with the University of Bergen an all year survey of the phytoplankton of Nordåsvatn near Bergen was continued (K. Tangen).

##### 2. Special phytoplankton studies

a) Taxonomic studies with the use of transmission and scanning electron microscopy were continued on coccolithophorids (K. Ringdal Gaarder and B. Riddervold Heimdal), diatoms (G. Rytter Hasle and B. Riddervold Heimdal) and microflagellates (J. Throndsen).

b) The study of Coccolithus huxleyi, its life cycle and fine structure, has been continued (D. Klaveness). Comparative morphological and physiological studies of coccolith-bearing and naked C. huxleyi have been concluded. (E. Paasche, D. Klaveness).

c) Investigations on nanno-phytoflagellates have been continued (J. Throndsen).

d) Experimental work has been continued on changes in the content of chloroplast pigments and enzymes in plankton algae induced by different light regimes and by different nitrogen sources (E. Paasche).

e) The distribution of Nitzschia seriata and allied species has been investigated (G.R. Hasle).



Programme for 1971

Phytoplankton Surveys

a) Investigations mentioned under 1970-1a), b) and c) will be continued.

b) New surveys 1971

1. An oceanographic survey of the inner Hardangerfjord with the object of obtaining a basis for possible future studies of the effect of changes in the fresh-water supply. The phytoplankton part. (T. Braarud).

2. A study of the phytoplankton of Skjomen, as part of a broader oceanographic project organised by the Tromsø marine biological station. (B. Schei).

3) A survey of the phytoplankton in coastal waters of the southern Norwegian coast in autumn and winter. (In collaboration with the Marine Research Institute, Fisheries Directorate, Bergen).

Special Phytoplankton Studies

Studies mentioned under 1970 - 2a), c) and d) will be continued.

6. University of Trondheim, Museum

1) Zooplankton and phytoplankton studies based on net and pump samples were carried out in the Trondheimsfjord.

2) Phytoplankton and zooplankton investigations were carried out in the Borgenfjord, based on collections made with net, pump and fraction collector.

3) Experimental work on the ecology of Goniaulax tamarensis was started.

4) Manuscripts have been prepared on the phytoplankton investigations in the Trondheimsfjord (E. Sakshaug) the relationship between Mytilus toxicity and the observed occurrence of Goniaulax tamarensis (A. Jensen and E. Sakshaug), the zooplankton investigations in the Trondheimsfjord in 1963-69 (T. Strømngren) and the vertical distribution of zooplankton in the upper 50 m in the Trondheimsfjord (T. Strømngren).

Poland

(W. Mańkowski)

The investigations on plankton were carried out in several areas and the sampling was performed by means of a number of different gear as shown in the following table :

Area	No of Stations	Hensen-net	Nansen net	Copenhagen-net	Ringtrawl	Sampler
Baltic Sea	329	562	113	102	-	-
North Sea	99	90	-	-	7	33
NW Atlantic	90	92	-	-	-	-
Barents Sea	30	30	-	-	-	-
NW Shelf of Africa	75	75	-	-	-	-

The phytoplankton of the Baltic Sea has been analysed on the basis of samples collected by means of Copenhagen nets and included the composition of species in particular regions of the area of the Southern Baltic (Arkona Deep, Bornholm Deep, Slupsk Furrow and Gdańsk Deep), of the Central Baltic (during summer) and in the Gulf of Finland (also during summer). Seasonal occurrence of phytoplankton and its distribution have been established. Also comparative studies of the results from the year 1970 with respect to the years 1967 and 1968 have been conducted for the same area of the Southern Baltic.

Zooplankton has been analysed on the basis of the samples collected from vertical hauls - from the bottom up to the surface - by means of Hensen nets. Vertical distribution of zooplankton was established on the basis of the samples collected from particular layers by means of Nansen nets. The above investigations included : the volume of wet plankton and the weight of its wet and dry mass per  $\text{lm}^2$ . Species composition of the macroplankton and its division into three size groups for each species have been determined.

In a separate investigation the quantitative distribution of pelagic eggs and larvae of fish was determined.

The samples of plankton from the North Sea were analysed with respect to species composition of zooplankton with particular consideration given to the distribution of herring larvae.

In a similar way, the zooplankton from the Barents Sea and from the waters of NW Atlantic was analysed.

The waters of the Shelf of NW Africa were investigated during the period January/March. The samples of plankton were taken starting from the depth of 100 m upwards to the surface of the sea. The measurements of the biomass were performed as well as the determination of species composition of plankton. Also the distribution of eggs and larvae of fish was established with particular emphasis to commercial fish species. The data for the latter will be presented in a contribution at the Meeting of the ICES Plankton Committee.

In the Szczecin Firth the investigations were concentrated on the changes in plankton production under the influence of industrial and agricultural pollution of these waters. This investigation was based on samples collected from 7 permanent (once per month) and 3 additional stations (once in a fortnight) during the period May/November. Vertical sampling of plankton in order to determine its biomass were conducted by means of the Apstein plankton net. Simultaneously, hydrological studies were carried out (temperature, salinity, the contents of oxygen and phosphates). In total, 60 samples were collected.

In the above mentioned stations water samples for the determination of the content of chlorophyll were also taken in May, July and August.

#### Portugal

(E. de Sousa e Silva)

#### Phytoplankton

1) The taxonomic and ecological data obtained in the study of Diatoms from the Sado estuary were prepared for publication (Maria Antonia Sampaio).

2) Investigation of the life cycle of some dinoflagellates from culture. Studies of their cytology and fine structures (Estela de Sousa e Silva and Jaime Pinto).

3) Chromatographic and spectrophotometric studies of pigments in two species of dinoflagellates (Maria Etelvina Assis).



### Zooplankton

1) Taxonomic and quantitative study of Copepods and other zooplankton in samples caught in Sado estuary over the year 1969 (Maria Helena Vilela).

2) Investigation of the life cycle in the Copepods : Cyclops robustus and Acartia grani (M.H. Vilela).

### Programme for 1971

Phytoplankton : a) Plankton sampling is being made at 24 stations placed along the west and south coasts of Portugal during five cruises : the first one in October 1970 and four others in 1971. Diatoms, Dinoflagellates and Tintinnids are being studied in net and sedimented sea water samples taken at the surface and at a depth of 50 m. Pigment determination and counting by spectrophotometry are made in sea water samples taken at several depths. (Estela S. Silva, M. Antonia Sampayo and M. Etelvina Assis).

b) The studies mentioned above (2) and (3) will be continued.

Zooplankton : a) The studies mentioned above (1) and (2) will be continued (M.H. Vilela).

b) Some essays of the copper toxicity are being tried on Copepods of the genus Tisbe from cultures (M. Helena Vilela).

### Espagne

(J. Corral)

### Laboratorio Oceanográfico de Santander

Des pêches de plancton on été effectuées durant les premiers mois de 1970 pour obtenir des données sur la productivité primaire de la baie de Santander et des eaux proches, ainsi que pour l'échantillonnage des Chaetognates sont étudiés actuellement à Madrid à l'Université.

### Laboratorio Oceanográfico de Baléares

M M. Durán a réalisé des échantillonnages pour la détermination de pigments dans le phytoplancton dans le port de la baie de Palma de Mallorca.

### Laboratorio Oceanográfico de Canarias

Dr J. Corral a terminé l'étude des échantillons de Copépodes pris de septembre 1968 jusqu'à octobre 1969, rédigeant et publiant un travail extensif sur la taxonomie, la distribution et l'écologie des communautés de copépodes épiplanctoniques dans la baie de Santa Cruz de Tenerife au cours d'un cycle annuel, trouvant un total de 111 espèces, dont 4 sont citées pour la première fois dans l'Atlantique.

Pendant 1970, divers échantillons de zooplancton ont été obtenus dans divers îles de l'Archipel. L'étude des copépodes de ces échantillons est actuellement en cours.

### Laboratorio de Investigaciones Pesqueras de Cadiz

Dr R. Establier a continué les études dans la baie de Cadiz, effectuant, dans quatre stations, des déterminations de pigments contenus dans le phytoplancton, afin de déterminer la productivité de ces eaux, études qui ont pour but l'installation de parcs d'élevages de mollusques.

Laboratorio de Investigaciones Pesqueras de Barcelona

Le Professeur R. Margalef a étudié le phytoplancton de 111 échantillons du sud et sud-est de la péninsule ibérique et 155 échantillons d'une section Corse-Barcelona et de l'aire de Castellon, pris durant l'expédition du "N.O. Thompson" en Mars, obtenant des données sur le mélange vertical des eaux dans le bassin occidental de la Méditerranée et la distribution à petite échelle du plancton aux alentours du fleuve Ebro.

Mlle Blasco a continué ses travaux sur la culture de Scenedesmus, Skeletonema, Cyclotella et Thalassiosira, étudiant les taux d'assimilation des nitrates, excretion de nitrites, modifications de pigments assimilateurs, action de l'intensité lumineuse sur la vitesse d'assimilation de l'azote et activité des enzymes nitrate-réductases en relation avec la concentration en nitrates du milieu et l'état physiologique des cellules.

Mlle Blasco et M A. Cruzado ont étudié l'inter-relation possible entre l'assimilation de nitrates et silicates quand les uns ou les autres sont des facteurs limitants de l'accroissement dans les populations de diatomées.

Quelques espèces de Diatomées de classification douteuse sous microscope optique ont été révisées en utilisant le microscope électronique.

Dr F. Vives a réalisé l'étude de la biologie et de l'écologie des crustacés planctoniques de la plateforme côtière de Castellon et des copépodes dans les échantillons obtenus dans l'Atlantique moyen oriental à bord du "Meteor", ces échantillons couvrant un total de 217 espèces de copépodes.

On a également étudié les larves de poissons, crustacés et mollusques dans des pêches effectuées sur les côtes de Balnes (Gerona).

Sweden

(A. Linquist)

West coast : Investigations on the occurrence of fish eggs and larvae have been continued. As in April 1969, in April 1970 it was also possible to catch numerous elvers after attracting them by an underwater lamp. Up to now, it has not become clear if there is a special path of immigration in the Skagerak and when the elvers occur in greatest numbers. The experiments are being continued. In the Kattegat, a new October survey for the occurrence of herring larvae was carried out (part of an ICES programme).

Baltic : Numerous samples have been taken for investigations on the occurrence of fish eggs and larvae (mainly cod and sprat) as well as for zooplankton in general in the Baltic. The material has been worked up.

United Kingdom

1. England and Wales

(D.H. Cushing)

The amount of plankton collected in 1970 was relatively small compared with 1968. The huge volume of plankton material collected in 1968 and 1969 is being counted and the results analysed by computer.



## Plankton collected during 1970

### Zooplankton - Southern North Sea

1. A plankton sampler survey for plaice ova, plaice and herring larvae in January of an area between 52°30'N and a line extending from the Cherbourg peninsula to Beachy Head (D. Harding and A.C. Burd).
2. Studies of the vertical distribution of plaice larvae using the Lowestoft Multiple Plankton Sampler and a modified Boothbay Net (D. Harding and D.S. Tungate).
3. A routine fish egg and larval survey in December of the Southern North Sea (D. Harding and A.C. Burd).

### Zooplankton - English Channel

A Survey in December in the Lyme Bay area for fish eggs and larvae (D. Harding and A.C. Burd).

### Zooplankton - East Coast of England

A survey of the inshore waters between Berwick and North Foreland for fish eggs and larvae using a 30 cm Lowestoft sampler. (J. Riley).

### Phytoplankton - North Sea

1. Phytoplankton collected between Flamborough Head and Berwick (P. Ayrnes, Burnham Laboratory).
2. A collection of dinoflagellate samples in March (Dr N. Reynolds)

### Plankton Gear Tests at Sea

1. Trials with a 61 cm diameter Bongo Net (D. Harding and D.S. Tungate).
2. Filtrations tests with various nets (D. Harding and D.S. Tungate).

### Calibration of Plankton Samplers at National Physics Laboratory

The 51 cm diameter high-speed Lowestoft Plankton Sampler was calibrated in the Circulating Water Channel of the National Physical Laboratory's Ship Division at Feltham, with the following results :

- 1) A linear relationship between flowmeter rev/sec and channel velocity over the range 90-260 cm/sec.
- 2) A linear relationship between the volume of water accepted by the sampler and channel velocity, both in free-flow and with the net in position.
- 3) With a 35.6 cm diameter nose cone aperture ( $R = 6.2$ ) the net (24.6 meshes/cm porosity 46%) reduced the volume of water accepted at 5 knots by 9% from the free-flow value; with a 20.3 cm diameter aperture ( $R = 19.0$ ) the net had no effect. Equivalent filtering efficiencies were 91% and 100%.
- 4) Estimates of the volume of water accepted based on the product of mouth area ( $A$ ) and distance towed in unit time ( $D$ ) exceeded the measured values for the 35.6 cm and 20.3 cm diameter nose cone apertures by 10% and 39% respectively.
- 5) Measurements of velocity profiles inside the sampler indicated a complicated three-dimensional flow pattern with very large fluctuations in linear velocity. The net had a funnelling effect and the flow accelerated along the central axis to the apex.
- 6) Velocity and pressure gradients extended to a maximum of 80 cm ahead of the sampler at 5 knots. Work has also begun on the calibration of the 76 cm diameter sampler (G.P. Arnold).

Programme for 1971

North Sea - Zooplankton and Phytoplankton

- 1) Three plaice egg and larval surveys covering the Flamborough plaice spawning area.
- 2) Ten plaice egg and larval surveys covering the Southern North Sea plaice spawning area from the Straits of Dover to Lat. 54°15'N.

English Channel Area - Zooplankton and Phytoplankton

- 1) Seven fish egg and larvae surveys covering the Eastern part of the Channel.
- 2) One small survey for fish eggs and larvae in the Lyme Bay area in the Western Channel. The gear to be used for the 1971 series of cruises consists of a 30" Lowestoft plankton sampler fitted with a 60 mpi filter and 2 auxiliary smaller samplers fitted with 256 mpi and 200 mpi filters. Electrical equipment will monitor depth, temperature, transparency and chlorophyll A automatically.

2. Scotland

Aberdeen ( J.H. Fraser)

The surveys by the research vessels from Aberdeen which included plankton sampling were : Northern North Sea in March, August, September, November and December; west coast in April, October, November and December; Shetland in August, September and October; Rockall in April; Faroe-Iceland in December.

Plankton work from the Aberdeen laboratory in 1970 was essentially similar to that of 1969 although there are some changes -

- a) Plankton and its relation to the general environment and the fisheries (zooplankton J.H. Fraser, phytoplankton D.D. Seaton).
- b) Routine collection of zooplankton standing stock data from the northern North Sea and west coast waters. Biomass and dry weight (J.A. Adams, R. Hardy), chlorophyll a (J.A. Adams and I.E. Baird).
- c) Standing stock survey of the northern North Sea in May in relation to herring migration (J.A. Adams).
- d) Plankton of the Rockall area (J.H. Fraser, D.D. Seaton and J.A. Adams) and larval fish (R.S. Bailey).
- e) Study of problems associated with handling and behaviour of plankton samplers (J.A. Adams).
- f) Food and distribution of predatory species in the Scottish area, particularly medusae (J.H. Fraser).
- g) Zooplankton standing crop and population in inshore lochs (N.T. Nicoll, J.A. Adams).
- h) Sampling on Ballantrae Bank spawning ground to measure production of recently hatched larvae in March (A. Saville).
- i) Sampling of herring larvae in the north-west North Sea as part of an international survey of herring larval production in all major North Sea spawning areas. Scotland sampled the area from 56°N to 59°30'N and between 0° and 5°W in September-October (A. Saville).
- j) Plankton associated with pollution in general (J.A. Adams, D.D. Seaton) and with pulp mills (J.H. Fraser).
- k) Zooplankton of the Firth of Clyde in relation to hydrography and pollution ( J.A. Adams).
- l) Monitoring for the presence of toxic dinoflagellates in coastal waters (D.D. Seaton).



Programme for 1971

In future, there will be an increase in studies of zooplankton feeding and further developments in the studies of predatory zooplankton, and a decrease in the specific analysis of zooplankton from general surveys. Zooplankton dry weight and chlorophyll a will be the main parameters monitored.

Ocenographic Laboratory, Edinburgh (G.A. Robinson)

The survey by the Continuous Plankton Recorder was continued in 1970 on the same basis as in recent years. The standard routes of the survey are shown in the Administrative Report of the Hydrography Committee. Recorders were towed for 125 000 miles by thirty-five vessels of eight nations during 1970. Two new routes were started in the Irish Sea (Liverpool to Dublin and Cardiff to Waterford).

Studies of the planktonic environment of herring fisheries of the north-east coast of Scotland were extended in 1970 to include the herring fishery off the west coast of Scotland. Samples have been taken nightly during the fishing seasons by the fishermen and by the crews of ferries belonging to the MacBrayne fleet which make frequent journeys between the Hebrides and the mainland of Scotland.

U.S.S.R.

(A.F. Karpevich)

As in previous years, in 1970 data on zoo- and phytoplankton were collected in the areas of feeding of herring and their larvae in the Norwegian Sea. The production of the main species of zooplankton is calculated on the basis of the data obtained. These main species of zooplankton serve as food for herring. In the Barents Sea plankton was collected along the ways of the commercial fish larvae drift from the Lofoten area, aiming at studying the effect of food resources on larvae survival. Observations on distribution and abundance of Euphausiacea which are important food objects of adult fish and fry, are conducted in the Barents Sea.

The material collected is presented in the Table below :

Area of sampling	Months	Number of samples
1. The Norwegian Sea (Zooplankton)	March-June	1 316
2. The Norwegian Sea (Phytoplankton)	April-June	382
3. The Barents Sea (Zooplankton)	April-July	1 462
4. The Barents Sea (Euphausiacea)	January-February September-November	159

In 1971 the investigations will be continued in accordance with the same programme.